Claims:

1. A fuel cell stack capable of internal hydrogen generation, the fuel cell stack comprising:

at least one fuel cell comprising an anode with a fuel inlet port for a hydrogen containing fuel, a cathode with an oxidant inlet port;

at least one chamber for a solution comprising a solvent and at least one chemical hydride dissolved therein, and having a chamber inlet and a chamber outlet for the solution and a catalyst within at least one chamber for catalyzing reaction of the solution to generate hydrogen.

2. A fuel cell stack as claimed in claim 1, which includes at least two fuel cells and wherein said at least one chamber comprises at least one chamber between and adjacent pair of fuel cells.

3. A fuel cell stack as claimed in claim 2 wherein said at least one chamber comprises a chamber provided between each adjacent pair of fuel cells, each chamber having a respective chamber inlet and chamber outlet and including the catalyst within the chamber.

4. A fuel cell stack as claimed in claim 2, wherein each chamber is formed by a recess provided on a rear side of the cathode of one of the fuel cells.

5. A fuel cell stack as claimed in claim 2, wherein each chamber is formed by a recess provided on a rear side of the anode of one of the fuel cells.

6. A fuel cell stack as claimed in claim 2, wherein each chamber is formed by a recess provided on a rear side of the cathode of a fuel cell and a facing recess provided on a rear side of the anode of an adjacent fuel cell.

7. A fuel cell stack as claimed in any of claims 4, 5 or 6, wherein the catalyst comprises a layer of catalyst foam.

8. A fuel cell stack as claimed in any of claims 4, 5, or 6, wherein the catalyst comprises a layer of material that is coated onto the surface of the chamber.

9. A fuel cell stack as claimed in any of claims 4, 5 or 6, wherein the catalyst comprises a plurality of pellets disposed within the chamber.

10. A fuel cell stack as claimed in claim 1, wherein the flow paths for the said solution within the fuel cell stack, both upstream and downstream of the said chamber, are lined with a non-electrically conductive insulating material.

11. A fuel cell stack as claimed in claim 10, wherein the non-electrically conductive insulating material comprises a polymer.

12. A fuel cell stack as claimed in claim 10, wherein the non-electrically conductive insulating material comprises a rubber.

13. A fuel cell stack as claimed in claim 10, wherein the non-electrically conductive insulating material comprises a silicon.

14. A fuel cell stack as claimed in claim 10, wherein the non-electrically conductive insulating material comprises a polypropylene.

15. A fuel cell stack as claimed in claim 10, wherein the non-electrically conductive insulating material comprises a ceramic.

16. A fuel cell stack as claimed in claims 1, 3, 6 and 10, wherein the anode of each fuel cell includes a fuel outlet port and the cathode of each fuel cell includes an oxidant outlet port.

17. An energy generating system, comprising:

(a) a fuel cell stack capable of generating hydrogen internally and comprising:

at least one fuel cell having an anode with a hydrogen inlet port, a cathode including an oxidant inlet port, and at least one chamber with a chamber inlet port and a chamber outlet port, and a catalyst in at least one chamber for catalysing reaction of a solution comprising a solvent and an at least one chemical hydride dissolved therein to generate hydrogen;

(b) a storage means for storing the solution;

(c) a circulation loop, at least connected to the storage means, each chamber inlet port and each chamber outlet port, for circulating the solution from the storage means through the fuel cell stack;

(d) a supplying path, connected to the hydrogen inlet port of each fuel cell anode and each chamber outlet port, for supplying hydrogen generated inside the chamber back to the fuel cell;

wherein the fuel cell stack generates electricity and water from hydrogen and an oxidant .

18. An energy system as claimed in claim 17, wherein the cathode of each fuel cell includes an oxidant outlet port, and wherein the energy system further comprises:

a recovery means connected between each oxidant outlet port and the circulation loop for recovering the water generated in the fuel cell and supplying the recovered water to the solution during the reaction as the at least one chemical hydride is consumed in use.

19. An energy system as claimed in claim 18, wherein the recovery means comprises a gas-liquid separator, for separating oxidant gas from the water.

20. An energy system as claimed in claim 19, wherein the storage means includes another gas-liquid separator interconnected in the circulation loop

and having an outlet for hydrogen connected to the supplying path, and wherein the hydrogen generated in each chamber is separated from the chemical hydride solution in the separator, upstream of the fuel cell in the supplying path.

21. An energy system as claimed in claim 20, which includes a switch means connected between the supplying path and each chamber inlet port and operable to enable hydrogen gas to be passed through each chamber to flush out the chamber.

22. An energy system as claimed in claim 17, which includes a heat exchanger located upstream of each chamber in the circulation loop, for adjusting the temperature of the solution.

23. An energy system as claimed in claim 22, which includes a heat exchanger connected in series with the first supplying means and the chamber, for cooling the solution.

24. An energy system as claimed in claim 17, wherein each fuel cell includes, as an electrolyte, a proton exchange membrane.

25. An energy system as claimed in claim 17, wherein the solution comprises a solvent comprising water and an at least one chemical hydride comprising borohydride.

26. An energy system as claimed in claim 25, wherein the solution comprises a solvent comprising water and an at least one chemical hydride in the form of MB_xH_y, wherein M is a metal.

27. An energy system as claimed in claim 26, wherein the at least one chemical hydride is selected from the group consisting of: $NaBH_4$, $LiBH_4$, KBH_4, and $RbBH_4$.

28. An energy system as claimed in claim 17, wherein the solution comprises a solvent comprising water and at least one chemical hydride comprising $NaBH_4$ and less than 5% by weight of $LiBH_4$.

29. An energy system as claimed in claim 17, wherein the solution comprises a solvent comprising water and an at least one chemical hydride comprising NH_3BH_3.

30. An energy system as claimed in claim 17, wherein the solution further comprises a freezing point depressing agent.

31. An energy system as claimed in claim 30, wherein the freezing point depressing agent comprises glycerol.

32. An energy system as claimed in claim 31, wherein the concentration of glycerol is less than 5% by weight.

33. An energy system as claimed in claim 32, wherein the concentration of glycerol is about 1% by weight.

34. An energy system as claimed in claim 17, wherein the solution further comprises an alkaline additive.

35. A n energy system as claimed in claim 34, wherein the alkaline additive is selected from the group consisting of: LiOH, KOH, and NaOH.

36. An energy system as claimed in claim 35, wherein the alkaline additive comprises 0.1% NaOH by weight.

37. A method of generating and supplying hydrogen to a fuel cell, the method comprising:

(a) providing a supply of solution comprising a solvent and an at least one chemical hydride dissolved therein;

(b) supplying the solution to a catalyst in the fuel cell to catalyze the reaction of the solvent and the at least one chemical hydride to generate hydrogen;

(c) removing the solution comprising hydrogen, by-products, and unreacted solution from the fuel cell;

(d) separating the hydrogen from the solution; and

(e) delivering the generated hydrogen to the fuel cell.

38. A method as claimed in claim 37, further comprising the steps of:

(f) recovering water from the exhaust of the fuel cell; and

(g) supplying the recovered water to the supply of the solution, to compensate for water consumed during the reaction of the solution to generate hydrogen, and to promote maintenance of concentration levels for products of the reaction at acceptable levels, thereby delaying the onset of any precipitation of products tending to limit the generation of hydrogen.

39. A method as claimed in claim 37, further comprising the step of adjusting the temperature of the solution upstream of the fuel cell.

40. A method as claimed in claim 37, wherein the temperature of the solution is raised upstream of the fuel cell.

41. A method of operating a fuel cell as claimed in claim 37, wherein the temperature of the solution is lowered upstream of the fuel cell.

42. A method as claimed in claim 37, further comprising the steps of:

(h) stopping the supply of the solution to the fuel cell;

(i) flushing hydrogen through the solution flow path to expel the remainder of the solution from the fuel cell upon shut-down of the system.